

ART. XVII. Report on the Epidemic Cholera, as it has appeared in the Territories subject to the Presidency of Fort St. George. Drawn up by Order of the Government, under the Superintendence of the Medical Board. By WILLIAM SCOTT, Surgeon and Secretary to the Board. Madras, 1824. pp. 292. Folio. With Appendix, &c. Du Choléra-Morbus de Pologne; Renseignements sur cette Maladie, recueillis par la Commission des Officiers de Santé Militaires envoyée à Varsovie, par M. LE MARECHAL DUC DE DALMATIE, Ministre de la Guerre. Paris, 1832. pp. 176. 8vo.

Cholera, as it has recently appeared in the towns of Newcastle and Gateshead; including Cases, illustrative of its Physiology and Pathology, with a view to the Establishment of Sound Principles of Practice. By T. M. GREENHOW, of (Newcastle upon Tyne.) London, 1832. pp. 162. 8vo.

Practical Observations on Cholera Asphyxia, communicated in a Report to the Greenock Board of Health, as the result of a Mission to the Infected Districts. With an appendix. By JAMES B. KIRK, M. D. Greenock, 1832.

Etude du Choléra-Morbus en Angleterre et en Ecosse pendant les mois de Janvier et Fevrier, 1832. Par le Professeur J. DELPECH. Paris, 1832. pp. 283. 8vo.

Traité Pratique, Théorique et Statistique du Choléra-Morbus de Paris, appuyé sur un Grand Nombre d'Observations recueillies à l'Hôpital de la Pitié. Par J. BOUILAUD, Médecin de cet Hôpital pendant l'Épidémie, Professeur de Clinique Médicale à la Faculté de Médecine de Paris, Membre de l'Academie Royale de Médecine, &c. Paris, 1832. pp. 426. 8vo.

Monographie du Choléra-Morbus Épidémique de Paris, Rédigée spécialement sur les Observations Cliniques de l'Auteur à l'Hôtel-Dieu de Paris. Par A. N. GENDRIN, D. M. Membres des Sociétés de Paris, Lyon, Louvain et Philadelphie; Médecin de l'Hôpital Cochinchin; Chargé pendant l'Épidémie d'un des Services de l'Hôtel-Dieu de Paris. Paris, 1832. pp. 336. 8vo.

THE pestilence whose progress we have been so long watching at a distance, has not only reached, but has actually already traversed no inconsiderable portion of our continent, and its past history affords ample grounds for the apprehension, that it will not only pervade our whole hemisphere, but that even where it has already prevailed it will again recur—that it may take root in our soil, and for an indefinite period annually sprout forth with greater or less vigour.

The subject has consequently lost none of its interest, even to those who have already had to contend against the ravages of this scourge, whilst to those who are anticipating a visitation, it has become one of absorbing importance; we therefore feel it to be our duty to redeem, without further delay, our promise of entering upon the consideration of its symptoms, pathology and treatment. We have never, however, undertaken a task with greater reluctance, and if personal considerations were permitted to influence us, we would postpone its performance until time should be allowed to digest more satisfactorily the large mass of materials before us. But during this delay, the ravages of the disease over our whole country might be accomplished, and as our gleanings, imperfect as they are, may perhaps prove useful to the profession, we do not feel ourselves justified in withholding them.

Malignant cholera is far from presenting any uniformity in the mode of its attack; on the contrary great diversity is observed in its symptoms. In most instances, its onset is violent and sudden, but usually preceded by certain premonitory symptoms, as furred tongue, diarrhoea, and general failure of the digestive powers, with pain or weight at the serobiculus cordis, or some part of the abdomen, and frequently head-ache, tinnitus aurium, &c. Sometimes there is increased vascular action, giving to the patient a feeling of unusual good health, and a greater excitement of animal spirits than is usual to him; much more frequently, the patient feels languid, weary and oppressed, with a general feeling of undefined indisposition.* This state often continues for several hours or even days without being followed by the more characteristic features of the disease, or may even cease, the disorder proceeding no further. Usually after these slight symptoms, and often some hours after a meal, or more frequently still at night, the patient is attacked with a sensation of violent oppression, of cardialgia, frequent nausea, almost constant and colligative diarrhoea, with fluid discharges resembling rice water; vomiting soon comes on, and after the common contents of the stomach, a clear watery fluid, interspersed with flocculi is discharged, and a feeling of exhaustion, sinking and emptiness is experienced. The powers of locomotion are speedily arrested; spasms affecting occasionally and by turns the whole of the muscles of voluntary motion, but particularly those of the legs, feet and hands come on; the pulse becomes small, weak, and accelerated; respiration laboured; tongue broad, pale and moist, &c.

* Greenhow, p. 5.

This condition of things soon ushers in another still worse. There is now a distressing sense of pain and burning heat in the epigastrium, with urgent thirst and desire for cold drinks; the blood forsakes the surface; the skin becomes cold, covered with a clammy, colliqueative moisture, corrugated on the fingers and toes, and inelastic; the lips are livid or blue, and the limbs and parts of the body assume the same colour; the pulse gradually decreases until it is no longer to be felt at the extremities, and finally even the action of the heart is scarcely perceptible on the application of the ear to the chest; the respiration is oppressed and slow; the breath cold; the voice feeble and altered; the eyes are sunken and surrounded by a livid circle, the features contracted and the face exhibits a peculiar cadaverous aspect; the tongue becomes cold, and for the most part white with pink at the edges; bile and urine are no longer secreted; at this period the vomiting, purging and spasms generally abate, and sometimes entirely cease. The sensorial powers do not participate in this wreck of the organic functions. The patient is often drowsy, but answers distinctly and accurately all questions put to him. In some cases his sense of feeling appears acute, causing him to complain greatly of the heat applied to restore warmth to his surface; in other instances, however, the skin is not sensible even to the action of chemical agents. It often happens that the patient dies at this stage, without convulsions, or any apparent pain, and more frequently without the knowledge of those who surround him, so insensible is the transition from life to death, and so strongly does the living patient resemble the corpse.*

When a fatal result is averted, either by the efforts of art or the recuperative powers of nature, the skin becomes gradually dry and warm; the pulse is developed, the tongue slightly red, the respiration freer, &c. Should the reaction be moderate and sustained, the patient may now recover; but if on the contrary it is violent, the skin becomes hot, the eyes injected, tongue dry and encrusted, coma ensues, and death closes the scene.

If this brief outline of the disease be accurately drawn, it would appear that we may trace in its progress five stages; viz.—1st, the initiatory stage; 2d, the onset of the disease; 3d, the stage of collapse; 4th, the period of reaction, and 5th, the adynamic or typhoid stage.

It must not be, however, supposed that these stages are to be recognised in every individual case. On the contrary, the disease sometimes runs through the first and second stages, with such rapidity,

* Archives Générals, May, 1832.

that they cannot be distinguished, and the patient appears at once to fall into collapse. These are the most fatal cases. There is sometimes in such cases but little apparent commotion in the system; no vomiting; hardly any purging, perhaps only one or two loose stools; no perceptible spasm; no pain of any kind; a mortal coldness with arrest of the circulation comes on, from the beginning, and the patient dies without a struggle. Several instances were heard of at Hobby, and other places in India, of natives being attacked with the disease whilst walking in the open air; and having fallen down, retched a little, and complained of vertigo, blindness, and deafness, they expired in a few minutes.* Similar cases were reported to the Medical Board of Bombay by Mr. GORDON.† A woman, walking on the Boulevard, in Paris, in the neighbourhood of Neckar Hospital, was seized with cramps, fell, and before she could be placed on a litter was dead.‡

Considerable differences have also been observed in the symptoms in different persons and at different epidemic visitations. Thus at one period it has been distinguished by the absence of vomiting, and the prevalence of purging; on another, by the excess of vomiting, and though more rarely, by the absence of purging. Spasm has been generally present in one instance of invasion, and in another not distinguishable.§

In Paris it was observed, that in children, females, and very irritable persons, nervous symptoms predominated; the cramps were attended with true convulsions; symptoms were even observed which simulated tetanus, during the paroxysms of which the patient expired. In plethoric subjects, with large and robust bodies, the inflammatory form of the disease manifested itself more frequently, the tongue was red and irritated, the epigastrium was the seat of acute pain, there was violent fever, very copious vomiting, insatiable thirst, and other symptoms demanding evidently an antiphlogistic treatment. In other instances the asphyxial type predominated—the blueness of the skin occurred from nearly the commencement of the attack, and the death of the patient took place often very promptly.||

Having thus attempted to point out the ordinary succession of the phenomena of cholera, and the more usual varieties in its feature, we proceed to the more particular consideration of the symptoms.

The *premonitory symptoms*, as they have been termed, upon which

* Orton, p. 8.

† See Report, p. 82.

‡ The Cholera Spasmodica as observed in Paris in 1831, &c. By ASHBEL SMITH, M. D. of North Carolina.

§ Madras Report.

¶ Archives Générales, April, 1823.

so much stress has been recently laid, were not overlooked by the practitioners of India, though many of them appear to have viewed these symptoms as having no other connexion with the epidemic than as predisposing to its attacks. Thus Mr. SCOTT remarks—

*"This most formidable disease does not appear to be attended with any premonitory symptoms which can be regarded as being at all peculiar to it; on the contrary, we may safely assert, that it is of sudden invasion: for though a slight nausea, a laxity of the bowels, and a general feeling of indisposition are often found to precede cholera, yet these symptoms are evidently common to many acute diseases; and they are especially frequent in this climate, without being followed by any graver ailment. When such symptoms are found to precede cholera, they might with more truth be regarded as indicating merely a certain deranged state of the alimentary organs, a condition of the body which certainly predisposes a person to an attack of cholera."**

All the practitioners in India do not, however, agree with Mr. SCOTT in representing the disease as unattended with premonitory symptoms. Thus, MR. ORTON represents the attack as usually sudden, "but in a great majority of instances, not without some premonitory symptoms."

"It is frequently," he adds, "preceded by a simple diarrhoea, continuing several days, and still more commonly by other slight affections, which are more characteristic of the disease. Most commonly, it is in the middle of the night, or early in the morning, that these ominous disturbances are first felt. An extraordinary depression of spirits and general uneasiness comes on, attended by tremor and sense of debility, giddiness, and head-ache, and occasionally ringing in the ears, are also felt, particularly on rising from the recumbent posture, or making any sudden movement. Pains, resembling those which attend the accession of fever, are sometimes felt in the limbs. The bowels are gripped occasionally, and natural loose stools occur; nausea comes on. The circulation and the temperature of the body are variously disturbed, but most commonly the pulse is accelerated and weakened, and the skin is moist, and colder than usual to the hand of another. These symptoms, or some of them, not unfrequently continue many hours, or even a day or two, without proceeding much further, or exciting much attention."

MR. ANNESLEY says, that one of the first symptoms the patient is sensible of, is a burning sensation between the scrofula cordis and umbilicus, and that he has never seen a case of the epidemic wherein it did not exist.†

DRS. RUSSEL and BARRY, in their report from St. Petersburg, dated July 27th, 1831; state the disease to have been often preceded for one, two, or more days by ordinary diarrhoea. MR. SEARLE, who

* Madras Report.

† Sketches of the most prevalent diseases of India, &c. 2d edition, p. 34.

saw the disease both in India and Poland, says that his experience warrants him in saying, that the cholera is usually preceded by diarrhoea of some hours' or even days' duration, and that this symptom is often preceded by others of even longer continuance; such as a sense of malaise or lassitude, with oppression at the praecordia, and not unfrequently with constipation of the bowels.* M. S. PINEL, who also observed the disease in Poland, asserts, that its attack was very rarely instantaneous. Very frequently, not to say always, there had been, in persons who appeared to be suddenly attacked, precursory symptoms, but which had not been attended to; the most common were *pains in the epigastrium*, and along the spinal column, cramps in the calves of the legs, and sensations of shootings in the fingers and toes.†

Dr. RANG, of Orenburg, represents the disease in that city to have announced itself several days in advance, by nervous symptoms similar to those produced by the gas from charcoal, by vertigo, giddiness, restlessness, insomnia, paleness of the face, coldness of the chest, palpitations, *pains in the abdomen*, *disgust of food*, loss of appetite, constipation, &c.‡

Dr. KIRK asserts, that diarrhoea always precedes cholera, and he has adduced the testimonials of nearly forty practitioners of England and Scotland, in support of that declaration.

In Paris, it was remarked that most of the subjects attacked with cholera, had been affected for several days and sometimes even several weeks, with derangement of the digestive organs, so slight generally, however, as not to have attracted much attention. This derangement consisted in a diarrhoea, the origin and cause of which was for the most part unknown, which continued two or three days, ceased and again returned, without any other general phenomenon except a slight feeling of debility.§

M. GENBRIN's testimony is to the same purport, and we must be permitted to quote his remarks on this point.

"Epidemic cholera is always," he observes, "preceded by precursor symptoms. I have met with patients who declared that they had not experienced any derangement in the health previously to the sudden invasion of the characteristic symptoms; but these patients were, for the most part, men living in poverty, or constantly half drunk; they belonged to that class, which is so large in hospitals, who are accustomed to neglect the derangements of health which

* London Med. Gaz. Jan. 1832, p. 506.

† Gaz. Med. de Paris, Tom. III.

‡ Recherches Historiques et Critiques sur le Choléra Morbus. Par F. E. Fodéré, p. 165.

§ Gazette Médicale de Paris, Tom. III.

are not attended with great pain, or to that class whose faculties are so little developed, that they cannot give an account of the symptoms they experience, although they may be evident to the physician at the moment he questions them. I have never seen any person living in a tolerably regular manner, whose intellectual faculties were at all developed, or belonging to that class of persons who give a correct account of their feelings, who has not declared that he had experienced precursory symptoms. As a great number of patients have been under my observation, I do not hesitate to lay it down as a fact, which admits of but rare exceptions, that the ebolera morbus is constantly announced by premonitory symptoms, (*prodromes.*) They present two forms; the diarrhoeal and vertiginous." p. 15.

In Canada and in the United States, most of the authorities concur in stating, that disorder of the digestive organs, and for the most part diarrhoea, preceded the explosion of the more violent choleric symptoms.

This so general precedence of the cholera in all countries, by derangement of the digestive functions, and more especially by diarrhoea, appears to us to indicate a more intimate relation between them than is admitted by the author of the Madras Report, and to show that this last is the effect of the epidemic influence, determinative of the first; and that it is in all instances either the initiatory stage of the pestilence, or a mild form of the same, easily aggravated into its most malignant shape by imprudence in diet, exposure, neglect, &c. In a disease so perfectly unmanageable in its early stages as cholera, and which has hitherto proved so utterly refractory to medical treatment in its subsequent progress, it is impossible to attach too much importance, or to insist too strongly upon this point. During the prevalence of the epidemic, every symptom of disorder of the digestive apparatus should be viewed with suspicion, and it is the duty of the profession to impress upon their patients the importance, in all such cases, of applying early for advice.

Vomiting.—This is a prominent symptom in cholera, but there are numerous instances in which it is entirely absent. According to Mr. Scott, in certain epidemic visitations in India, there was scarcely an individual case in which it was manifested;* and M. Pinel asserts that in Poland it was absent in three-fifths of the cases.† In Paris, London, and in this country, this symptom has been observed to be pretty constantly present. In some cases the stomach seems to be freely and perfectly emptied; at others there is an ineffectual straining and painful effort to vomit, and a spouting up of any fluid which is swallowed, as if by an effort of the lower part of the oesophagus, rather than of the stomach itself. Vomiting

* *Madras Report.*

† *Gaz. Med. de Paris,* III. 102.

is sometimes altogether absent, or if it has been present, soon ceases, from an atonic state of the stomach, under which this organ receives and retains whatever may be poured into it, as if it were really a dead substance. This is a most alarming state, but it must not be confounded with the same condition arising from the absence of irritation of the stomach.

The matters expelled by the mouth are ordinarily at first the usual contents of the stomach, afterwards it consists of a whitish, sero-mucous liquid, more or less transparent, sometimes inodorous, and mixed with albuminous flocculi. In some instances this fluid is of a yellowish, at others of a greenish tinge, probably owing to the admixture of bile, though Mr. Scott thinks it is too readily admitted that these colours are owing to this course.

"Supposing, however," he remarks, "that either the yellow or green hue of the matter vomited in cholera, indicates the presence of bile, it is undoubtedly of rare occurrence, especially during the acute stage of the disease. It would appear, nevertheless, that apparently bilious matters have been vomited, particularly at the beginning, and towards the favourable termination of the disease, and even in cases, which have ended fatally."

The quantity of fluid vomited is various, sometimes being prodigious, issuing from the mouth of the patient in an almost constant stream, at others the discharge is small.

Dr. CLANNY states, that a careful analysis of this discharge has given him the following results:—Water, 991; fibrine, 5; albumen, 1; carbonate of soda, 2; animal extractive, 1.*

Purging is a more constant symptom of cholera than vomiting, and usually precedes it. This symptom is rarely altogether absent, though it unquestionably is so occasionally, and when this is the case it appears to denote a peculiar malignancy in the attack. In cases, where little or no purging has taken place during life, the intestines, have yet been found, after death, to be filled with rice water, like matter, as if they had wanted energy to throw it off, or, as if a stricture had been formed on the lower portions of the gut. The dejections are sometimes made without effort or uneasiness; at others, they are thrown out with great force, which has been compared to the squirt of a syringe. There is seldom much griping or tenesmus, although the calls are very sudden, and are irresistible. In advanced stages of the disease, purging generally eases; but in many cases a flow of watery fluid from the rectum takes place on any change of position.†

The matters evacuated, after the first emptying of the bowels, are most usually a clear, watery fluid, with white flocculi, resembling

* Hyperanthraxis, or the Cholera of Sunderland. By Reid Clanny, M.D. p. 112.

† Madras Report.

rice water; Mr. Scott describes its most common appearance to be that of pure serum, so thin and colourless, as not to leave a stain on the patient's linen. Sometimes the matters evacuated, are greenish or yellowish, from a tinge of bile, or turbid, of a frothy appearance like yeast, or rose-coloured from a small quantity of blood; occasionally of a deep chocolate colour, and not unfrequently bloody. Mr. OGILVY reports several cases in which "the evacuations were almost wholly composed of pure blood."** The re-appearance of faecal matter, especially if tinged with bile, Mr. Scott says, seldom, perhaps never, takes place till the disease has been subdued. In some cases, the dejections are inodorous, in others they have a very peculiar smell.

The quantity of the discharge is sometimes exceedingly great, and were it uniform, as Mr. Scott remarks—

"It might afford us an easy solution of the debility, thirst, thickness of the blood, and other symptoms: but it is unquestionable, that the most fatal and rapid cases are by no means those, which are distinguished by excessive discharges. We have innumerable instances, on the contrary, of death ensuing after one or two watery stools, without the development of any other symptom affecting the natural functions. Even collapse has come on, before any evacuation by stool had taken place."†

The following results were obtained by Dr. Clanny on analysis of the dejected fluid:—Water, 989; fibrine, 6; carbonate of soda, 3; animal extractive, 2.

Spasm has been considered by many as an essential feature in this disease, so far, however, as relates to the muscles of voluntary motion, says Mr. Scott, no symptom is more frequently wanting.

"Spasms of the muscles," he adds, "chiefly accompany those cases, in which there is a sensible and violent commotion in the system. Hence they are more frequently found in European than in native patients; and in the robust of either, than in the weakly. In the low, and most dangerous, form of cholera, whether in European or native cases, spasm is generally wanting, or is present in a very slight degree. The muscles most commonly affected are those of the toes and feet, and calves of the leg; next to them, the corresponding muscles of the superior extremities; then those of the thighs and arms; and, lastly, those of the trunk, producing various distressing sensations to the patient. Amongst these, hiccup is not unfrequent, but it has been observed that this symptom, in cholera, is not at all indicative of danger. The muscles of the eye-balls have not been observed to be affected with spasm, unless the sinking of these organs in their orbits may be considered to be an effect of it. The reports make frequent mention of a remarkable, permanent contraction of the muscles of the abdomen, by which the belly is drawn towards the spine. The spasms attending cholera are of a mixed nature, not strictly clonic; the relaxations being less prompt and frequent than in epilepsy or convulsion; and seldom durable as in tetanus. The

* Orton, p. 34.

† Madras Report.

contractions of the muscles are invariably attended with pain, and some Medical Officers have observed, that a degree of spasmodic stiffness has continued for several days afterwards. It has also been remarked, that spasmodic twitchings of the muscles have taken place after death, and have continued for a considerable time. In one case, where a man had been paralytic in his limbs, with a total numbness of them, they were severely affected with spasms, and became exquisitely sensible. It is pretty evident, that there either has been an inaccuracy in the description of spasm occurring in cases of cholera, or a sensation differing from that of spasm has been confounded with it; for, by the descriptions, we would be led to suppose that the spasms begin, and are felt, in the toes and fingers, which cannot be the case. As the extreme muscles however are generally first seized with spasm, it is probable that the small fleshy bundles in the palms of the hands, and soles of the feet are affected; but there seems reason further to conclude, that pain is really felt in the fingers and toes, and that it is referable to a sort of nervous twinge or tic douloureux in these parts, distinct from spasm, which is not uncommon in other disordered states of the digestive organs.”

Trismus was observed in a considerable number of instances in India,† and it occurred in one case in the *Hôtel-Dieu* of Paris. The jaw has frequently continued locked several hours.

At Gateshead complete opisthotonos was observed, the body being contracted into a kind of ball, which it is impossible to roll out after death;‡ and M. Foy describes opisthotonos to have been a very usual attendant on the disease in Poland.§

Several instances are recorded in which spasm of the muscles of deglutition were brought on by attempts to swallow.|| Cramp of the stomach is by no means a common symptom.¶ Spasms usually come on early in the disease, and often cease when the stage of collapse is fully formed.

The returns of the paroxysms of spasm are frequently brought on by the slightest exertion; and in particular they appear to be intimately connected, in regard to cause, with those of vomiting, these affections frequently recurring together.**

Hemiplegia has been noticed as a consequence of cholera in one or two instances.††

Collapse.—Sinking of the circulation is the most invariable symptom in cholera; nevertheless, where instant remedial measures have

* Madras Report.

† Orton, p. 31, 39.

‡ Observations on the Pestilential Cholera, &c. By William Ainsworth, Esq. p. 58.

§ Du Cholera-morbus de Pologne ou recherches Anatomico-pathologiques, Therapeutiques et Hygieniques sur cette Epidémie. Par F. Foy, M. D. P. L'un de Médecins Envoyés en Pologne. p. 11.

|| Orton, p. 32.

¶ Ibid.

** Ibid. 2d edit. p. 3.

†† Ibid. p. 33.

been successfully practised, this symptom may not have developed itself. The period at which a marked diminution of vascular action takes place, is somewhat various.

"The pulse," says Mr. Scott, "sometimes keeps up tolerably for several hours, though very rarely. It more generally becomes small and accelerated at an early stage; and, on the accession of spasm or vomiting, suddenly ceases to be distinguishable in the extremities. The length of time, during which a patient will sometimes live in a pulseless state, is extraordinary. Dr. Kellett relates a case, where the pulse was gone within three hours from the attack; yet the man lived in that state, from the 3d of October, at 4 P. M., to the 6th, at 2 P. M. On the cessation of the spasms or vomiting, and sometimes, apparently, from the exhibition of remedies, the pulse will return to the extremities for a short time, and again it will cease. The superficial veins and arteries are not always collapsed, even when the pulse has ceased. If these vessels be opened in this condition, the contained blood flows out; their walls then collapse, and no more blood can be extracted. There is no authenticated fatal instance of cholera on record, where the circulation has not been arrested, in the extremities at least, long before death took place."*

Thirst, and a sense of heat or burning in the epigastric region, often extending over the whole abdomen, form very prominent and constant symptoms; yet not only in individuals, but even in epidemic visitations, Mr. Scott says, that they have been altogether absent. When they are present in the highest degree, and, as Mr. JAMESON observes,† "all is burning within;" the mouth and tongue are generally moist, cold, and blanched. At times, however, according to Mr. Scott, the tongue is parched, dry and furred, but he does not inform us at what period of the disease. It was probably observed only in the last stage.

The thirst is often excessive, and even uncontrollable, and the patients usually desire cold drinks, notwithstanding the coldness of the body.

The skin in cholera is cold, generally clammy, and often covered with profuse cold sweats. The coldness generally commences in the nose, cheeks and extremities, and finally extends over the body. Sometimes the skin is dry though cold, and at others is said to be of natural warmth. Just before death an increase of temperature has been repeatedly observed to take place, in the trunk and head; and in almost all cases, this *partial* development of heat is found to be a fatal symptom. It is entirely unconnected with any restoration of the energy of the arterial system, or any improvement in the function of respiration. The heat, in such instances, has been observed to continue for some hours after death.

* Madras Report.

† Bengal Report.

The sweat when thin, is usually poured out, in large quantity, from the whole surface of the body; but, when thick or clammy, it is more partial, and generally confined to the trunk and head. The perspiration is often free from odour; at times it has a fetid, sour or earthy smell, which has been said to be peculiarly disagreeable.

Frequently the skin is exceedingly sensible, the patient complaining even of burning when the hand is placed on the body; applications of moderate temperature cannot be supported, and vesicatories act well. When however the skin is much collapsed, Mr. Scott says that it becomes usually insensible, even to the action of chemical agents, and hence the usual vesicatories fail in producing any effect.

"The application of mineral acids, and of boiling water, in this condition of the skin, produces little or no effect, and some patients are said not to have been sensible of the operation."

When the state of collapse is at its height, and the whole surface has become cold, the body which at first was of a slightly plumbeous tint, afterwards becomes eburneous, and finally of a very deep blue.

Rigor is an occasional occurrence in the beginning, particularly of the milder cases.*

COUNTENANCE.—The remarkable shrinking of the features, constituting the peculiar countenance characteristic of cholera, and which when once seen can never be forgotten, has been noticed by all writers. The eye is sunk back and firm in its socket, surrounded by a livid circle, but half-closed when the patient is dozing; the cornea is dull and glassy, or covered with a transparent film, the sclerotica often injected, even ecchymosed. The expression is sad, indicative of extreme suffering and complete prostration; it is truly the expression of death.

The *respiration* is usually much disturbed and laborious, and there is often the most distressing sensation of oppression and suffocation. In the early stages Mr. Scott says that it is not usually interrupted, unless from a peculiarity in the mode of attack, under which spasm seizes the muscles subservient to that function, and that in many cases terminating in death, respiration has gone on in its mechanical part with little or no interruption, except that it becomes slower and slower, and in one instance was performed only seven times in a minute. Most writers, however, and among others Mr. Orton, represent the breathing as hurried and oppressed, and Mr. Scott remarks that in numerous instances it was most distressing, and could only be compared to the most violent attacks of asthma.

* Orton, p. 35.

In many instances the breath is cold.

The air expired by those labouring under cholera contains much less than the usual quantity of carbonic acid, according to Dr. Davy only one-fourth or one-third;* and it would appear from the experiments of Dr. Clanny, Guéneau de Mussy,† and M. Barruel, that the amount is sometimes even less. The last named gentleman says that he has ascertained that during collapse no change was effected in the chemical composition of the air respired—it contained no carbonic acid, and not an atom of oxygen had been absorbed.‡

The voice is very peculiar, being husky, feeble, and sometimes inaudible; yet instances are not wanting, in which it has continued of natural strength almost to the last moment.

There is usually considerable *restlessness* in the early stages of the disease, the patient constantly tossing about and throwing his arms out of the bed, and this is said sometimes to continue throughout the disease. Not unfrequently from the commencement, and usually in the latter stages, the patient lies in the utmost tranquillity.

The *intellectual faculties* are described by some writers as continuing perfect, in this disease, often even till the last moment; it must not, however, be supposed that they retain their ordinary vigour, and remain wholly unaffected amidst the wreck of the other functions. The mind is usually dull, though there is no positive *aberration* of intellect; and the patient often exhibits a total indifference to his fate, which is far from natural.

"In a disease," observes Mr. Scott, "so highly congestive as cholera, where vertigo, deafness, and ringing in the ears, often prevail, and where very large quantities of opium and intoxicating matters have been swallowed, it is truly surprising, that the functions of the sensorium are so very rarely disturbed. It seems probable, that it is in many instances, from an inaccuracy of language, that coma has been represented as a symptom of cholera: for we find that patients, who have just been represented to be in a *comatose* state, can, with more or less facility, be roused from it; and, though he cannot overcome that retirement within himself, which constitutes so remarkable a feature of the disease, he will yet evince, by the clearness and precision of his answers, that his intellect is not destroyed."

Coma is, however, admitted by Mr. Scott occasionally to occur, and in Europe, where the patients have died in the adynamic stage, it was usually present. Delirium, according to Mr. Scott, has seldom or never been observed, unless as a sequelæ of cholera, when other and foreign morbid actions have been established; but Mr. Orton§ says, that it is not an unusual symptom. In Europe and in this country, it has not occurred except in the stage of reäction.

* Ed. Med. and Surg. Journal. † Gaz. Med. de Paris, T. III. p. 219, 278.

‡ Archives Générals, April, 1832, p. 605.

§ P. 33.

State of the blood.—All the writers on cholera concur in stating the blood to be of a dark colour and thick consistence, and it is perhaps one of the most constant characters in this disease.

"These appearances are very uniformly expressed by the terms, dark, black, tarry, in regard to colour; and by thick, ropy, syrupy, semi-coagulated, in respect to its consistence. The change in the condition of the blood is likewise fully proved to be in the ratio of the duration of the disease; the blood at the commencement seeming to be nearly, or altogether natural, and more or less rapidly assuming a morbid state as the disease advances. Some very rare cases are recorded, where, however, this morbid state of the blood was not observable, although the disease had been for some time established: and instances have occurred, where the blood flowed readily, sometimes little altered, where, nevertheless, death ultimately ensued. The abstraction of blood has been found by all practitioners to be very difficult and uncertain; and the uncertainty has been variously imputed to the feebleness of the circulation, to the thick consistence of the blood, and to the combined operation of these causes. The blood drawn from patients, suffering under cholera, is stated to be generally very destitute of serum, never to exhibit the appearance of buff, and to be generally disposed to coagulate quickly. Several instances, however, have occurred, where the coagulation was slow and imperfect. A great majority of the reports state unequivocally, that, after a certain quantity of dark and thick blood has been abstracted from a patient under cholera, it is usual for its colour to become lighter, its consistence to become less thick, and for the circulation to revive: such appearances always affording grounds for a proportionably favourable prognosis. In many instances, however, no such changes have been observed to accompany the operation of bleeding, while yet the result was favourable. The blood is generally found to be less changed in appearance, in those cases of cholera, which are ushered in with symptoms of excitement, than where the collapsed state of the system has occurred at an early period. The blood has been occasionally found, on dissection, to be of as dark a colour in the left, as in the right side of the heart; affording reason to believe, that in the whole arterial system it was equally changed. The temporal artery having been frequently opened, the blood was found to be dark and thick, like the venous blood: but it would appear, that this operation has not been performed in general, until the attempts to procure blood from the brachial or jugular veins had failed: little or no blood could be obtained, the artery merely emptying itself in a languid stream, not in a jet, and then collapsing. An instance is stated, where the surgeon, despairing of other means, cut down upon the brachial artery, but so completely had the circulation failed, that no blood flowed. When refection has been established, the blood occasionally shows the buffy coat."*

We refer to our last No. p. 513, for an analysis of this fluid.

The secretion of urine is very generally much diminished, or entirely suspended; those cases in which it is secreted, are said not to be less dangerous than those where it was entirely suppressed. We

* Madras Report.

have met with two instances in which the secretion of urine was excessive, amounting to almost complete diabetes. This form, so far as we know, has not been described, it might be termed the diabetic. The fluid portions of the blood, instead of being discharged by the intestinal mucous membrane, pass off from the kidneys. In neither of the instances in which we have observed this form, was there complete collapse, but the debility caused by the discharge was very great—there was extreme lightness of the head, and giddiness, which was aggravated after each discharge of urine. There was also diarrhoea, but not the profuse serous evacuations from the bowels observed in other cases.

Reäction.—In India the cholera for the most part appears to have terminated in the cold stage either in death, or this stage was followed by prompt restoration to health. “In natives of this country,” says Mr. Scott, whose able report we have had so frequent occasion to quote, “in whom there is ordinarily very little tendency to inflammatory action, the recovery from cholera is generally so speedy and perfect, that it can only be compared to recovery from syncope, colic, and diseases of a similar nature.” It has also been observed in Europe that patients have recovered from collapse without the reäction transcending the normal standard, and hence some of the European practitioners, among others Dr. Ochel of St. Petersburg,* were led to believe, with the physicians of India, that this reäction was not a necessary stage, but a secondary disease.

This stage of reäction, however, was not always absent in India; it was observed in Bengal, and is described in the report of that presidency, as rising to a great height, assuming all the characters of the idiopathic bilious fevers of the country. Mr. Scott also admits that in Europeans, in whom there is a much greater tendency to inflammation, and to determinations to some of the viscera than in the natives of India, the recovery from cholera was by no means so sudden or so perfect as in the latter. On the contrary, he remarks, it too often involved affections of the intestines, of the brain, of the liver, and of the stomach. The brain and liver, according to Mr. Spence, were the organs generally affected in India, in what he terms the sequelæ of cholera.

“In one case which I attended,” he observes, “the brain became inflamed to an exceedingly violent degree after a smart attack of cholera; the patient was bled largely, both from the arms and temporal artery, with other depletory measures, before the febrile excitement could be subdued, and thoughulti-

* *Revue Médicale*, January, 1832.

mately he recovered his bodily health, he was an inmate for two years of the lunatic asylum. Another instance occurred where cholera was succeeded by fever of the pure typhoid character, which continued three weeks before the man became convalescent. One man was attacked with jaundice, attended with much fever, and after lingering many weeks, died a maniac."*

Mr. Orton also speaks of phrenitis supervening on this disease, and it is well known that insanity supervened in the case of the celebrated Casimir Périer.

In Europe the stage of reëction was much more distinctly marked and attracted more particular attention. It, however, exhibited considerable diversity in different cases. In St. Petersburg most persons in this stage were affected with delirium, which soon changed into a state of coma, in which the greater number perished, leading many physicians to believe that the cholera was nothing but a species of nervous fever. In many others, neither delirium nor coma occurred, but abdominal inflammations, very often of the liver, sometimes of the parotids; in others more or less violent gastric, bilious, inflammatory fevers; finally, there were some cases in which a more or less slow convalescence immediately followed a first paroxysm which had always some resemblance to an apoplectic intermittent fever.†

In Poland the stage of reëction was very generally observed, but its nature appears not to have been well understood, and hence, most of the writers speak of the disease terminating in, or being complicated with, typhus fever, or being often followed by that disease. Both in Great Britain and France, the reëction was distinctly observed, and was considered as a stage of the disease. In some cases, to the coldness marking the collapse, violent reëction ensued, the pulse became full, and exceedingly developed, the skin hot and disposed to be moist, precisely as in the hot stage of intermittent fever. It is not very common, however, for the reëction to be so fully and perfectly developed. Most frequently, says the editor of the *Gazette Medicale de Paris*, reëction is not at first decidedly established; it is only after several successive alternations of cold and heat that the latter persists, but in a feeble degree; the pulse becomes but little developed, the skin is dry and moderately warm. Some local symptoms next appear, most frequently of disorder of the brain, and a general state of prostration or even of stupor, which rarely however reaches the degree observed in very violent and long-continued typhoid fevers; the patient retains his intellect, and answers questions perfectly. The tongue is slightly red, but is not generally so dry and horny as in the fevers

* Med. Gaz. IX. 342.

† P. 11.

‡ Ochel, Rev. Méd. Jan. 1832.

alluded to. Finally, the adynamic symptoms do not reach that degree of intensity which would be expected from the reaction which should follow such a marked degree of collapse as occurs; it may be said that the vital forces exhausted in collapse are no longer capable of an energetic contest in the second; in these subjects the pulse is moderately frequent and but little developed. In some others the local symptoms are more marked; there is delirium or a state of coma, which goes on increasing until death, if not arrested in time.*

Medicine would be truly unworthy of the name of a science, as has been justly observed by M. Bouillaud, if it limited itself to a blind and frigid exposition of the symptoms of diseases; it must connect, compare, weigh, *appreciate* these symptoms; determine which of them plays the most important part; fix, if the expression be allowable, their hierarchy, their concatenation, series, relation, and coördination. Let us see how this can be accomplished in relation to cholera.

On examining the phenomena of that disease, two sets of symptoms particularly strike us; the abdominal pains, and the vomiting and purging of watery fluids—which M. B. very justly attributes to an eminently active secretory irritation of the gastro-intestinal mucous membrane—and the coldness and blueness of the extremities, disappearance of the pulse, extinction of voice, extreme prostration of the muscular forces, and the sudden diminution of the volume of the body, which he with equal propriety refers to a suspension of the vitality or organic actions in the exterior portions of the body. Now the question arises whether these two orders of phenomena appear simultaneously, or are developed one after the other; and if the latter be the case, which of the phenomena have the precedence.

"Now," says M. B. "it is ineontestable that the abdominal phenomena, the vomiting and purging, or one of them precede the exterior phenomena, as the coldness, the cessation of pulse, the blue or violet tint of the skin, as well as the suppression of the different secretions, and of that of the urine in particular. How little soever one may be acquainted with physiology, it would not be difficult to find the relation of cause and effect between the abdominal and other symptoms. In fact, who is ignorant of that physiological law by virtue of which the augmentation of one secretion produces a proportional diminution in others? And who does not see that conformably to that law, it is impossible that the enormous increase in the secretion from the interior of the digestive tube, should not be accompanied by the diminution or complete suspension of the secretion of urine and several other fluids? Let us add that these secretions cannot moreover, be formed but when the blood contains a sufficient quantity of serum or

* *Gazette Medicale de Paris.* III. 171.

water, a condition which does not exist, when the choleric evacuations, in great part composed of serum, have been excessively abundant.

"As to the other symptoms, as the coldness, blueness, weakness of the circulation, extinction of voice, we may explain them, at least to a certain extent, on reflecting that the choleric evacuations, suddenly and prodigiously diminishing the mass of humours, and of the blood in particular, must necessarily, as in profuse hemorrhages, (in a less degree however,) greatly weaken, not only the sanguiferous system itself, but also all the functions dependent upon this system. The secretion of so enormous a quantity of fluid cannot moreover be effected without a considerable consumption of the nervous power, which naturally presides over these functions, and of which the ganglionic nervous system appears to be the depository. Is not this kind of dereliction of the ganglionic nervous power effected, in part, at the expense of the innervation which animates the circulatory organs? Be this hypothesis, to which I do not attach the least importance, correct or not, what is certain is, that the sanguineous mass, almost totally deprived of its aqueous or more fluid portion, then presents a thickening, a viscosity which constitutes a physical obstacle to the circulation. The mass of blood having been thus considerably diminished, and the viscosity of the liquid which remains, opposing a certain obstacle to the organic power which moves it, it is not at all astonishing, even not taking into account the weakening of the nervous power, that the pulse should be enfeebled, gradually sink and ultimately disappear in the arteries most remote from the circulatory centre. This suspension of the arterial circulation, joined to the immense dereliction of caloric produced by the choleric evacuations, explains in its turn the coldness and the livid or blue tint, of the parts thus deprived of arterial blood, that is, of the vivifying principle of all the organs, of the principal conductor of the heat which penetrates them.

"There is yet another element, which must not be entirely neglected in the solution of the problem under discussion. We have seen that either on account of the weakening of the mechanical powers of the circulation, or on account of the new properties of the blood deprived of much of its serous portion, or finally, in consequence of these two causes combined, the chemical phenomena of respiration are performed in only an imperfect manner. Now, there results from this obstacle to the oxygenation of the blood, a particular asphyxial condition which must exert an influence over the violet or livid colour of certain parts of choleric patients. Let us add that the intensity of this tint should be in proportion to the profuseness of the choleric evacuations, (I do not allude to those which are sanguinolent,) which deprive the blood of its aqueous element, leaving its colouring matter entire; for it is clear, that the latter being no longer diffused in a sufficient quantity of water, must necessarily appear deeper."

Such is the physiological explanation of the symptoms offered by M. Bouillaud, and if it does not embrace all the phenomena, it may be made to do so by a slight extension, and it is the most satisfactory yet presented, fulfilling more of the capital conditions which we have a right to exact in all medical expositions. Perhaps too little account is taken of the nervous system, but it must be confessed that implicit confidence cannot be claimed for any explanations founded upon the functions of that apparatus, with the imperfect knowledge we have of

the subject. But may we not, to explain the spasms and neuralgic pains—the sudden death that sometimes occurs with but slight or at least without profuse evacuations, and the complete interruption of the relations and communication between the different apparatus by which the unity of the organism is destroyed, have recourse to a derangement of the ganglionic nervous system? It is the office of that apparatus to connect the various organs of the abdomen and thorax, and to place them in sympathetic relation; it is the chief agent in the maintenance of these organs in the performance of their functions, and the medium of communication between them and the cerebro-spinal nervous system.

Muscular contraction requires nervous stimulation for its accomplishment, and the production of convulsions by worms and indigestible matters in the alimentary canal, at once points out an irritative impression upon the ganglionic nervous system of the splanchnic apparatus, conveyed to the cerebro-spinal system, for an explanation of the spasms in cholera.

Extreme congestion of the secretory apparatus of the intestinal tube, and the consequent proportional deficiency in the other organs of the vital fluid—thus destroying the organic actions in the former by the overwhelming congestion, and arresting it in the latter by the debility caused by the abstraction from them of their nutritive element—may perhaps explain the sudden death which sometimes occurs without any profuse evacuations. But where life is sufficiently protracted in these cases, and always where complete collapse is established, we observe a phenomenon which seems to refer to the sympathetic nervous system for an explanation. We allude to the complete dismemberment of the different organs—the entire destruction of their connexion and sympathetic relations—so that the suffering organ is unable to relieve itself by radiating to some other, a portion of the irritation which is destroying it, and remedial impressions are no longer transmitted from one organ to another, medicines acting solely upon the part to which they are applied—constituting, as we shall hereafter see, the great obstacle in the treatment of the disease.

It being one of the functions of the ganglionic system to connect the various organs together, their disjunction manifestly indicates a suspension of that function; but it is equally certain that this lesion of the nervous apparatus is *secondary* to that of the digestive, for, as is correctly remarked by M. Gendrin, to give to the nervous symptoms of cholera the importance of primitive and dominant phenomena, would be contrary to all observation, which shows that the violence of the nervous symptoms bear no relation to the intensity of the disease.

We need not enter more fully into the physiological explanation of the phenomena of cholera at present, as we shall have to recur to it again, when considering the pathology of the disease.

If all derangements of the normal actions were indicated by constant and unequivocal symptoms, and the degree and extent of morbid lesions could be determined by the violence of these symptoms—their physiological explanation would conduct us at once to a correct pathology. But as the symptoms furnish uncertain information of either the degree or kind of morbid actions, and moreover, as extensive and even fatal lesions frequently occur without any appreciable external manifestations, a pure physiological system of pathology becomes impossible, and we are compelled to resort to other sources to supply the necessary data for a complete pathology. These are furnished by an examination of the body after death—let us then see what information is furnished by the post mortem examination of cholera patients.

The lesions observed on examination of the body after death from cholera, are found to vary according to the stage of the disease at which the patient dies, and their extent to be also influenced by the duration of the attack. When the patient is carried off after only a few hours illness, little time has been afforded for appreciable disorganizations to be effected, and the morbid changes are of course less striking than in those cases in which the patient has survived for a longer period, but manifest morbid alterations are always met with. We shall endeavour to sum up as briefly as possible these lesions, and shall commence with those observed in persons who have died in the period of collapse.

Upon opening the abdomen, the peritoneum is found to be quite dry, and we may remark, that all the mucous membranes are in the same condition, and that little or no serum is found in their cavities. Externally the digestive tube is observed to be very much injected, and of a ruse or violet tint. The different portions of this canal are also often more or less dilated by their liquid or gaseous contents. Sometimes we find a more or less considerable contraction either of the stomach or intestines. The intestinal parietes in some of their convolutions are commonly a little thickened, nearly as after general peritonitis, and may be said to be slightly infiltrated.* Intussusceptions are sometimes met with; M. Gendrin met with them in the ilium in three cases.

Observers differ in their descriptions of the colour of the mucous

* Bouillaud, p. 252.

membrane of the digestive organs. M. Gendrin says that from the mouth to the anus it is generally of a livid tint, but admits that in a third of the cases evident traces of inflammation are met with;* whilst M. Bouillaud asserts that it is almost constantly red, with red points, and arterial and minute capillary injection.† The consistence of this membrane is not generally altered, but it is by no means uncommon to meet with it softened, thickened or thinned in places of greater or less extent.‡ Another very remarkable lesion of this membrane is its putrid or gangrenous disorganization. M. Bouillaud has met with this lesion once in the ileum, and six times in the large intestine; and Mr. Orton met with it in one case in the small intestines.§ M. Sandras states that there are often found in the lower part of the small intestines and in the large intestine, plates of a black-red colour, like ecchymoses, sometimes of so dark a tint that the German physicians considered them as more or less decided gangrene—these plates were from a few lines to several feet in extent.||

The mucous membrane of the stomach over its whole circumference presents a multitude of small, white granulations, slightly grayish, presenting a very regular hemispherical projection. These granulations have no regular arrangement, and every where disseminated; they are still more numerous in the duodenum and jejunum than in the stomach. M. Serrcs says that they are so numerous and developed in the small intestines that the whole mucous membrane seems as if made up by them;¶ their number decreases towards the large intestines. On dissection these granulations are found to be the follicles of Brunner distended by a white, turbid fluid, and three times their natural size. This development of the follicles of the mucous membrane appears to be almost, if not constantly, met with, even when death occurs within twenty-four hours.

"The isolated follicles, or the glands of Brunner," says M. Bouillaud, "are those particularly which we observe more or less tumefied and developed; nevertheless it is not uncommon to meet at the same time that lesion in the plates of Peyer or the clustered follicles. This hypertrophy, this species of erection of the follicles of the mucous membrane of the digestive tube prevails sometimes through the whole extent of this immense membrane; and this gastrointestinal eruption, sometimes distinct, at others confluent, imitates to a certain extent the variolous eruption in its first stage. The number of follicles developed, when the eruption is confluent, is truly incalculable. We will only say, that any one who has seen this kind of eruption, will not consider the calculation of M. Lélut, by which the whole number of follicles in the alimentary mucous membrane is estimated at forty-two thousand, to be exaggerated. The

* P. 94. † P. 254. ‡ Bouillaud, p. 255. § P. 34. || P. 37, 38

¶ Gaz. Med. de Paris, Tom. III. p. 206.

sizc of these follicles thus tumefied varies from that of a small millet-seed to that of a hemp-seed. Their form is rounded and granular. Many of them have a blackish point at their centre. There are some which do not offer this character, and MM. Serres and Nonat, who have published some researches of great interest on the subject under consideration, think, as is known, that these granulations are not follicles, but *intestinal papillæ* in a state of tumefaction. We have studied with some care this point of pathological anatomy; and we are certain that an immense majority of the granulations with which the mucous membrane is covered, are really enlarged follicles, but we will not affirm that those on the summit of which there is no perceptible black point, and which marks the opening of follicles, are actually the same. The colour of follicular granulations is commonly a grayish-white; at their basis a more or less considerable injection is frequently met with." pp. 256, 257.

Incipient ulcerations are also occasionally met with in the intestinal follicles.

The whole intestinal tube is generally more or less distended with a whitish, turbid fluid similar to that discharged by vomiting and stool, and which fluid is in some degree pathognomonic of cholera. That fluid is to the disease, what the effusion into the pleura is to pleurisy, that into the peritoneum to peritonitis, &c. In the stomach, besides the choleric fluid there is found, usually a very considerable quantity of glairy mucus, more or less adherent to the mucous membrane; sometimes in place of this a layer of creamy matter is found, similar to that hereafter to be noticed as met with in the intestines. M. Bouillaud says that he has several times seen in the stomach a yellowish or greenish bile.

In the small intestines, two different kinds of liquid are contained, one the choleric fluid, the other a fluid, sometimes of a dark reddish colour, at others rosaceous, more frequently of the colour of chocolate or of lees of claret, the tint depending upon the greater or less proportion of blood which concurs to the formation of this liquid. It has more or less density, and is less abundant than the choleric fluid. It is not unusual to find both these fluids in the small intestines, in which case the whitish commonly occupies the upper convolutions, whilst the lower are filled with the reddish or sanguinolent fluid. When the intestine is emptied of these fluids, there remains upon the surface of the mucous membrane a layer of whitish, or grayish-white or sometimes yellowish, creamy matter, it is easily removed by a stream of water. Gas, lumbrici, and a greater or less quantity of yellowish or greenish bile are also met with.

The large intestines contain also the two fluids found in the small ones; these fluids are, however, thicker and more turbid than in the former. M. Bouillaud says that both these fluids are sometimes found in the

large intestines of persons in whose small intestines there is only the whitish liquid, but that the reverse does not occur, and that whenever the small intestines contain a reddish fluid, we are almost certain to find the same in the large intestines. The layer of creamy matter is thinner in the large than in the small intestine. In some cases a fluid resembling puriform mucus was met with. Gas and lumbrici are more frequently found in the large than in the small intestines, but bile is scarcely ever seen in the former.

The *liver, spleen, pancreas, mesenteric ganglions, kidneys and bladder*, present no lesion, except where the disease is complicated with some other; these organs are, however, more injected, and rather of a more violet hue than in their normal state. The gall-bladder is filled, and often distended with a viscid bile differing little from that usually found in it. The liver is generally injected with blackish, tolerably fluid blood; it is not, however, augmented in size. The ramifications of the vena porta are gorged with black, viscid blood.

The *spleen* is usually small and not congested.

The *kidneys* are most commonly injected with black blood, but unaltered in their tissue; the pelvis and ureters are empty; we remark only on their parietes a creamy, viscid matter, which also flows from their tubuli uriniferi on pressure.*

The *urinary bladder* is almost constantly empty, and firmly contracted under the pubis. Its mucous membrane is covered with the same creamy matter found in the intestines and kidneys.

The *heart, arteries and veins*, except in cases of complication, offer no notable lesion of structure. The arteries are nearly empty; in the larger ones, and in places only, a dark, viscid, imperfectly coagulated blood, precisely similar to that found in the veins, is met with. The whole venous system is gorged with blackish, viscid, semi-coagulated blood, forming nevertheless in some cases a clot of sufficient consistence to be drawn from the vein like a cord. This engorgement is the more marked the nearer the vessels are to the heart; it is especially considerable in the superior vena cava, the subclavians, the internal jugular, and the vena azigos. The heart, especially its right cavities, are generally gorged with blood similar to that found in the veins. Its proper veins are exceedingly distended with the same kind of blood.

The *lungs* are often flaccid and collapsed, frequently emphysematous, sometimes engorged in the posterior portion of their tissue; in these last cases M. Gendrin says that the bronchial mucous mem-

* Gendrin, p. 96.

brane is of a deep livid red.* In one case M. Bouillaud found on its surface a creamy layer analogous to that which covers the intestinal and vesical mucous membrane.

The *cerebro-spinal nervous system*, except in cases of complication, presents little or no appreciable lesion. The membranes of the brain and spinal marrow are healthy; their veins are injected with black, viscid blood. The pia mater at the posterior portion of the cerebral hemispheres, upon their convex surface and upon the cerebellum, presents several patches of true ecchymoses and well-marked sanguineous infiltration.†

The substance of the brain and spinal marrow preserves its normal consistency and texture; the medullary portion is slightly dotted with numerous minute drops of black blood. The nerves which go off from the brain, medulla oblongata and spinal marrow, present no alteration at their origin. M. Bouillaud says that he has recently dissected the nerves of the lower extremities, in a patient who had experienced violent cramps, and that he found them in a state of the most perfect integrity.‡

The phenomena of cholera appearing to indicate a suspension of function in the *ganglionary nervous system*, many careful investigations have been instituted for the purpose of determining the condition of this system after death. M. Delpach asserts that he found in his examinations, evident traces in the semilunar ganglions, of the physiological alterations they had experienced; that they were often enlarged, red, more or less injected, and sometimes remarkably softened, and that the blood with which they were injected was red, whilst the blood in the capillary system over all the rest of the body was black. The solar plexus, he says further, was always in a more or less abnormal condition, but always recognisable by the size of the nerves which compose them, often by the red injection of their neurilema and sometimes even by the softening of the nerves which form them, so that they break under the slightest effort or even the least pressure.§ The researches of Mr. Lizars, of Edinburgh, and M. Halma-Gand, appear to sustain this statement; but the investigations of MM. Gendrin, Bouillaud, Louis, Andral, and indeed all the Parisian pathologists are entirely opposed to it.

M. Bouillaud says that the important part which the semilunar ganglion and the plexuses which originate from it, are made to perform in cholera, induced him to attentively examine these parts in almost all the choleric who died in his hospital practice, and he declares

* P. 90.

† Gendrin, p. 97.

‡ P. 266.

§ Pp. 197, 198.

that the ganglionie nervous system did not in a single ease present any lesions of structure. In some cases, the ganglions and the plexuses had preserved their normal white or grayish-white tint. But most frequently he observes—

"The semilunar and cervical ganglions, like many other organs, were of a rose or violet tint, with or without manifest injection; this slight lesion of colour was more evident on the exterior than in the interior of the ganglions." p. 267.

M. Gendrin found the semilunar ganglions and all the ganglions and nervous plexuses perfectly healthy.

"Their tissue has," he says, "its natural colour and density, if we take care to dissect these so as to prevent the sanguineous imbibition which results from the effusion of blood from the veins whieh are necessarily divided in the examination. It is however observed, that the nervous ganglions in the bodies of choleric subjects, often present a reddish tint which is often found after many diseases and constantly in asphyxia." p. 97.

M. Begin has indicated a reddish colour of the *bones* and teeth as occurring in cholera, and this condition has been since observed by others. M. Gendrin states that he has found the osseous system, especially the spongy bones, very decidedly injected.

"This injection," he adds, "is the more manifest, as the bones receive, as is known, a considerable quantity of venous blood, which even appears deposited in their cells without the intervention of any membrane. The teeth present this injection; thus their root and the half of their crown are of a red tint, which causes them to be rejected by dentists for the fabrication of false teeth. This tint does not show itself until some hours after death; it then increases for two or three days and becomes finally permanent. Persons who trade in teeth, have remarked this red tint in the teeth of those who have died of several other diseases; they say for instance, that it constantly occurs in the teeth of those who have died of variola."

According to MM. Bouillaud and Rayer, however, this injection of the osseous system is by no means constant in cholera.

The *exterior habitude* furnishes some phenomena worthy of notice. The body is usually exceedingly rigid, and the muscles often contracted and prominent. A very remarkable phenomenon, noticed by all writers, is the spasmodic contraction of the museles for some time after death, causing movements of the limbs, and contortions of the features. Another equally singular is, that some hours after death, the body, whieh had previously resisted external heat, often becomes less cold than it was at the last moment of life, and is said sometimes even to have a *general warmth* diffused over it, although removed to an apartment below 50°; in one case Mr. Harwich says, that the temperature of the body two hours after apparent death was 105° Fah.*

Such are the principal anatomical phenomena observed in subjects who have died during the stage of collapse or asphyxia; but when death occurs in the period of reëction, very different lesions are met with on dissection. We no longer find in the digestive canal the white fluid; in its place we meet with a yellowish, semifluid substance, having the odour of faecal matter. The granular eruption of the mucous membrane of the digestive tube is less prominent, and is found less constantly. We sometimes observe, however, incipient ulceration of the follicles. The mucous membrane is exceedingly red, and presents unequivocal marks of inflammation. The stomach is often contracted, almost empty, containing only a little mucus or bile, presenting numerous rugæ on its internal surface, and the membrane thus wrinkled, presents a diffused, bright, arterial redness, as well as a capilliform injection and red points. The same redness also occurs in various parts of the intestinal mucous membrane.

The bladder, instead of being empty and contracted, is often distended with urine, and we no longer meet, either in the bladder or kidneys, any of the creamy matter found in them during the stage of asphyxia.

The nervous centres and their membranes now exhibit constant and often serious lesions. Their membranes are gorged with blood and serum. The pia mater is so infiltrated with serum, that it raises up the arachnoid, and gives to the surface of the brain a gelatinous appearance. Thus infiltrated with serum, this membranous net-work is much thicker than in its normal state. The ventricles are distended by a limpid, slightly viscous serum; and the plexus and tela choroidea are gorged with it, and at the same time injected like the pia mater. The cerebral substance is injected; presents more red spots than in the algid period, and in some subjects it is less firm than in its normal state.

In some cases the spinal marrow is slightly softened.

The blue or livid colour of the body has nearly or entirely disappeared.

If the lesions which present themselves in those who have died in the stage of collapse be compared together, it will be found that the most serious and important are those of the digestive tube. In fact, there is nothing met with in any other apparatus, that can be put in comparison with the choleric fluid, and the enlargement of the follicles, not to mention the redness, gangrene, sanguineous infiltration, &c. which frequently occur. The examination of the body after death, accords thus with the analysis of the symptoms, in showing that the principal element in cholera is the affection of the digestive passages.

The question now presents itself, which of the lesions observed after death are the primary ones, and what is their nature. Those of the alimentary canal being the most numerous and severe, it would appear justifiable to conclude, that they were the primary ones; and this conclusion is confirmed by an analysis of the symptoms which shows that the manifestations of gastro-intestinal derangement precede all the other symptoms.

The only other lesion, moreover, of any consequence, or which can be suspected of preceding the gastro-intestinal disorder, is the change in the condition of the blood. Now the investigations of Dr. O'SHAUGHNESSY, who has availed himself of the second eruption of cholera in London, to repeat his chemical inquiries relative to this disease, on a most extensive scale, and with a view, if possible, to decide the question, whether the alteration of the blood be primary or secondary, and to ascertain what are the conditions of the blood in the several stages of the disease, conclusively show, that—

"1st, in the *premonitory* symptoms, no alteration of the blood exists; 2d, in the cases in which the evacuations are trivial, and *cramps* form the prominent symptoms, the blood is also unaltered; 3d, the alteration of the blood consisting in loss of water and saline matter, only occurs in the collapse cases *preceded* by excessive rice water evacuations; 4th, this alteration of the blood gradually disappears, or increases in the fever stage, according to the aggravation or amelioration of the symptoms."

The rigorous analysis of the symptoms during life, and of the derangements met with after death, concur thus in pointing out as the lesion of the organism constituting cholera—as the constant disorder, that which is never wanting in this disease—an effusion upon the inner surface of the intestinal tube of a serous fluid, which is afterwards rejected by vomiting and purging. This secretion is dependent upon an alteration, equally constant, at least in its early stage, which alteration consists in the development of the secretory follicles disseminated over the digestive tube. The exaggerated secretion of the intestinal follicles must have been necessarily preceded by an active afflux towards these follicles, and it must also be necessarily accompanied by that state of turgescence of the secretory organs accompanying all augmented secretions—an active state to which Borden has called the attention of physicians, and of which post mortem examinations have always shown the traces when death has not occurred too late.

This fluxion towards the follicles of the digestive tube is among

* London Lancet, Aug. 11, 1832, p. 603.

the earliest effects of the cause, whatever it may be, productive of cholera, and seems to be the result of the well-known law, *ubi iritatio, ibi affluxus*. Starting from this orgasm of the follicles alluded to, we have little difficulty in showing how all the phenomena of cholera follow as natural results.

These follicles gradually increase in size under the influence of this active fluxion to them, their secretions are augmented, and thus is produced the serous diarrhoea which precedes the cholera in most instances. As soon as the secretion is increased in the whole digestive tube, sufficiently to quickly subtract from the blood a large portion of its elements, the choleric symptoms appear. Previous to this, the loss which the blood suffers is slight, the circulation repairs it continually, and this loss could not suffice to alter this fluid, rapidly and so as to be immediately irreparable. Thus, the intensity of the general symptoms is in proportion to the suddenness of the serous secretions. A person in whom these secretions occurred slowly, would suffer less at the end of three or four days, although he may have lost a large quantity of serum, than another would be at the termination of an hour, in whom the desperdition would have taken place suddenly, even though he had lost less serum. For the same reason the disease becomes very speedily fatal in those who have scarcely any or no discharge by vomiting or stool, but whose alimentary tube is suddenly filled by the product of the secretion, and this especially in persons whose vital powers are enfeebled by previous disease, irregular habits, &c.

Debility, coldness of the extremities, feebleness of the pulse, oppressed respiration, and syncope, are the immediate results of all sudden losses of blood; it is quite intelligible then how they occur in a disease in which the blood is suddenly deprived of some of its elements; they also occur in excessive serous diarrhoeas, and in ordinary cholera. If we add to this the thickening of the blood, we will have all the phenomena of epidemic cholera.*

In proportion as the blood is rendered thick and viscid, and the propulsive power of the heart enfeebled by the excessive choleric secretions, will the circulation be diminished. The diminution of the circulation through the lungs causes derangement of respiration—this function is imperfectly performed—hence the proper changes of the blood in the lungs are imperfectly and ultimately not at all effected, and the portion of this fluid, which reaches the left side of the heart,

* Gendrin, p. 136.

is similar to that sent to the lungs by the right side of that organ. The suspension of the general circulation, and the dark colour of the blood produces a blueness or bronze colour in those parts, in which the thinness of the skin permits the colour of the blood to be partially seen—as occurs in asphyxia. The circulation being suspended, animal heat can no longer be generated, and hence the body becomes cold. The lessening of the mass of fluids by the choleric evacuation, causes the shrivelling of the fingers and toes, as is observed in some profuse haemorrhages; our esteemed colleague, Professor Dewees, notices it as occurring in uterine haemorrhage. Thus are the phenomena of collapse produced.

In some cases the profuse secretions from the bowels are arrested, or diminished, either spontaneously, which is rare, or from the effect of remedies, and the circulation then has a tendency to be re-established, unless the blood has been altered to such a degree that all re-establishment of the circulation is impossible—we have thus re-action—a febrile action, in which the circulation of the blood is accelerated, and that fluid propelled towards the lungs, there to be decarbonized, and towards the heart to be united with the fluids rapidly absorbed, as soon as the function of absorption is restored. The immediate result of this re-action is to repair the disorders occasioned by the intestinal secretions—the excessive secretion from the bowels having abated, and the principles essential to nutrition being supplied to the blood, the secretion of urine, of bile, &c. are re-established.

The difficulty to the establishment of re-action is proportional to the alteration which the blood has undergone, and the evils which follow this re-action result, at least in great measure, from this change in the blood. The brain here suffers more than any other organs, except the digestive, because the venous circulation is carried on in it by a peculiar apparatus, which renders the progression of the blood slower and more difficult, and which thus easily leads to congestions. This congestion persists notwithstanding the re-action, if the viscid and semi-coagulated blood of the sinus presents an obstacle to the re-establishment of the cerebral circulation. Congestion is reproduced in the re-action, probably because while there is an augmentation of the activity of the arterial impulsion in the brain, the circulation through the sinuses is still retarded.

That the ganglionic nervous system performs a more or less important role in cholera is probable, since there is no irritation of the abdominal viscera of any degree of intensity, which cannot react

upon that system; but when we reflect upon the constant, extensive and profound lesions of the gastro-intestinal mucous membrane, and the rarity of any notable lesion in the abdominal ganglions and plexuses, we must admit that the affection of the ganglionic system can only be consecutive to that of the apparatus on which its ramifications are expanded.

Such is the anatomical history of the lesions in cholera, and it is in accordance with all the facts observed, and leaves none of the phenomena unaccounted for.

We have considered the fluxion to the secretory follicles of the gastro-intestinal mucous membrane as an active one, and the increased secretion from these vessels to be the result of an exaggerated action, and this view is in strict accordance with what we observe to result from stimulants, productive of increased secretions in mucous membranes. Some pathologists, not finding in the gastro-intestinal mucous membrane those appearances and alterations which they consider essential to inflammation, have assumed as the primary lesion in cholera, a stasis of the blood dependent upon enfeebled action of the heart, and referred the choleric fluid to a passive exhalation or leakage from the vessels. Not to mention other and insuperable objections to this theory, it is sufficient to state that if an adynamic state of the heart were the primary disorder in cholera, it should commence with the disease, and all the others should be consecutive, which is not the fact. Further, in cholera all the secretions except that from the intestinal follicles, are suppressed; now, if this suppression were owing to adynamia of the heart, the former secretion ought to be equally suppressed. If the choleric fluid was produced by a mere leakage from the vessels, it should consist of the fluid portion of the blood unaltered; but this is not the case; all the analyses of that fluid showing it to contain an excess of saline materials, and of *fibrine*, whilst the blood is found to be proportionally deficient in those elements.

MM. Louis and Andral appear to lay great stress upon the frequent absence of any softening of the mucous membrane, as proving the non-inflammatory nature of the secretory action of that membrane in cholera. Softening is, however, only one, and by no means a constant result of inflammatory action, and even if it were, MM. L. and A. would still have to prove, to sustain their doctrine, that an exaggerated action in the secretory vessels must necessarily be accompanied by the inflammatory state of the nutritive vessels, productive of softening.

Other pathologists taking their notions of the essential phenomena

of inflammation from those exhibited in phlegmon, and not finding constantly redness of the gastro-intestinal mucous membrane, have adduced this circumstance in support of the same views. Here again no distinction is made between the secretory and the nutritive vessels. It seems little surprising that the prodigious demands made by the secretory vessels, should divert to themselves all the supplies of blood; and it is well known that the moment the intestinal secretions abate, and the demands for a supply of materials for these secretions consequently lessened, we have injection of the nutritive arteries, softening, ulceration, and other phenomena of inflammation of the mucous tissue.

The secretory action of the mucous follicles is then an active one, and that its character is inflammatory we have the strongest possible evidence in the fact of coagulable lymph being one of the constant products of this action. The analysis of the choleric fluid by Dr. Christie in India,* and Dr. Clanny in Sunderland, show the presence of coagulable lymph in that fluid; while the analysis of the blood by Dr. Thompson shows a remarkable deficiency of fibrine in this fluid, in one case the quantity being only one-third, and in another only one-tenth, that which exists in healthy blood. Now, the effusion of fibrine is admitted on all other occasions, as in croup, peritoneal dropsies, &c. as evidences of inflammatory action having existed, there is no reason why it should not be received as such in this case.

Cholera is then, as believed by M. Bouillaud, a secretory irritation of the follicles of the gastro-intestinal mucous membrane. This form of gastro-intestinal irritation differs from others, according to M. B.—1st. As regards its symptoms, in the abundance of the evacuations, and the peculiar qualities of the rejected matters. 2d. As to its anatomical alterations, which are the immense extent of the gastro-intestinal irritation which often extends through the whole tube; the presence of two fluids, elsewhere described; the distinct or confluent eruption of the intestinal follicles, and not unfrequently gangrene of certain portions of the irritated membrane.

"It is especially in consequence of the terrible rapidity with which so vast an irritation occurs, and of the prodigious depredation of the fluids which follows this secretory irritation, that we see the strength suddenly disappear, the circulation diminish, the extremities become cold, the features alter, and in a word, the patients to become *cadaverized*." p. 285.

If the views we have given of cholera be correct, the indications of cure, are in the initiatory stage to allay the irritation of the mucous

* Observations on the Nature and Treatment of Cholera, &c. &c. By Alex. Turnbull Christie, M. D. &c. Edinburgh, 1828.

follicles, and arrest the determination of blood to them; for by accomplishing this we shall prevent the exaggerated secretion, the source of the subsequent evils. In the onset of the disease, the indication is to arrest the excessive secretion, which is to be accomplished by the same means. In the collapsed or blue stage we have additional indications, viz. to supply to the blood the elements which it has lost, and to restore the circulation. In the adynamic stage various indications are presented; we have to sustain the refection when deficient, and to moderate it when in excess; to relieve the congestion in the brain, and arrest the inflammatory disorganizing actions going on in the digestive tube. Let us now inquire into the means that have been employed to accomplish these objects.

In the preliminary stage of cholera, the irritation is to be allayed, and fluxion to the bowels arrested by soothing remedies and revulsives, among which we may enumerate absolute diet, demulcent drinks, opiates, bleeding, mustard pediluviae, &c.

"An immense majority," says M. Bouillaud, "of both hospital and private practitioners, are now in favour of the soothing, antiphlogistic method, aided by opiates and astringents in moderate doses. I can affirm, that I know of no case of mild cholera treated conformably to this simple and reasonable plan which terminated fatally, and I have heard very distinguished practitioners affirm the same.

"Thus then, as soon as an individual experiences diarrhoea, eolie, or vomiting, with sensation of anxiety, oppression, or real pain in the epigastric region, he must at once be put upon a rigid diet; leeches should be applied to the epigastrium, abdomen or anus; if the patient is young, vigorous, and plethoric, blood is to be taken from the arm; demulcent drinks, gum julep, with a few drops of laudanum, are to be ordered: and repeated small enemata with four or five drops of laudanum in each administered; cataplasms or fomentations are also to be applied to the abdomen.

"It must be constantly borne in mind, that it is in consequence of having neglected or badly treated a simple diarrhoea, that many persons have been affected with intense cholera, to which so many have succumbed. This fatal occurrence will be prevented by insisting upon the preceding method, employed from the appearance of the first symptoms. It has the immense advantage over every other method, of not subjecting the patients to any catastrophe, and it does not constitute one of those games of *double or quits*, which the prudent practitioner never plays. Doubtless, in the stage under consideration, recourse has been often had, with an appearance of success, to emetics, and even to purgatives. But has it never happened that this treatment has excited or hastened an attack of intense cholera? Some facts cited in different parts of this work, seem to authorize us to answer that such has been sometimes the case. Nevertheless, we find even at the present moment that some physicians crowd the journals with articles, in which they rapturously praise the marvellous effects of purgatives, as a general method of treating cholera! The time will come, I

hope, when such deplorable precepts will no longer seduce the ignorant, and death will not be a gainer by it." pp. 321, 322.

Not a few cases have recently been recorded in the foreign journals of cholera being excited by purgatives, and several occurring in this city have come within the notice of the writer of this article. Two instances are related by M. Voisin, *Intern de St. Louis*, in the *Gazette Médicale de Paris*, for the 12th of June, 1832. The first was M. Dœuf, his colleague, who took large doses of resin of copaiba to act as a revulsive on the large intestines for the cure of gonorrhœa, and who was attacked with cholera, and died in fourteen hours. The second was a patient whose thigh had been amputated, and who was doing exceedingly well. Two ounces of castor oil were given him for the removal of constipation, which brought on vomiting and purging with cramps, &c. and the patient died. The stump and joint on examination presented nothing that could in the least account for the death. The patient unquestionably died of cholera. One case which has been related to us, is too striking not to be noticed. A robust labourer applied to an apothecary in this city during the prevalence of cholera for a dose of calomel and jalap, for the relief of constipation, and uneasiness in the bowels. The apothecary advised him not to take so powerful a purgative, but the man persisting, the dose was given to him, and next day he was a corpse. Other instances of the danger of purgatives might be adduced were it necessary. Where it is important to empty the bowels of any ingesta, a small dose of oil, (half an ounce,) with twenty or twenty-five drops of laudanum, we have found to answer the purpose.

In the second stage or onset of the disease, characterized by the secretion into the bowels of the choleric fluid, the treatment is nearly similar to that recommended in the first stage. To allay the gastro-intestinal irritation, demulcent drinks, as gum water or rice water, and enemata of the same with a small portion of laudanum are to be administered; small doses of morphium may also be given by the mouth. Care must be taken, however, not to administer opiates in such doses as to suppress the evanescences too suddenly, and before revulsion is effected. The temperature of the drinks should be that most agreeable to the patients; when there is great heat in the epigastrium, small pieces of ice taken into the mouth will be found to allay this heat, and also relieve the vomiting. As revulsive means, venesection, topical depletion by leeches or cups, fomentations to the abdomen, and si-napisms to the extremities, or mustard *pediluviae*, are to be employed.

M. Gendrin says that in this stage of the disease he bleeds, as a means of revulsive depletion, gives a demulcent drink, as rice water,

administers enemata rendered slightly narcotic, and aids these measures by sinapisms or stimulating frictions to the extremities.

When the reëction commences, he recommends, if it is moderate, not to disturb it, but to favour the crisis by emollient drinks. If it be too violent, the bleeding is to be repeated, or leeches applied behind the ears if the head is threatened, or upon such parts of the abdomen as may become painful.

"I have not lost," he adds, "a single patient with simple cholera, whom I have treated in the phlegmorrhagic stage, and I have constantly found that it was by the mode of treatment that I have just indicated, that the disease yielded most promptly, and that convalescence, always so troublesome from cholera, was most easily accomplished."

M. Gendrin has also administered in this period small doses of narcotics by the mouth and anus, with great advantage; but he has sometimes had to regret their arresting too suddenly the evacuations. M. G. gave the sulphate of soda in one case with the effect of arresting the phlegmorrhagia, but an obstinate gastro-enteritis was the consequence.

"To modify the intestinal excretion," observes M. G. "by narcotics, astringents, and various stimulants, while we do nothing to relieve or divert the secretory fluxion to the digestive tube, is to expose ourselves to substitute for a phlegmorrhagia a most serious gastro-enteritis, or to excite a violent febrile reëction which will produce serious disorders in the head and abdomen." p. 183.

In the collapsed or blue stage, especially in its commencement, we have still the indication to fulfil, of abating the secretory irritation and the fluxion to the digestive mucous membrane; the remedies already recommended for that purpose are to be employed, but with particular reference to the condition of the patient at this time. Venesection is here to be resorted to with great caution. It must be remembered that the object of this remedy is to produce revulsion, and that this may be effected, there must be a certain degree of vigour in the circulation. In robust and plethoric subjects then, whose pulse is still to be distinctly felt at the wrist, a vein may be opened in the arm, and if the blood flow freely, and the pulse rises, or at least does not sink, a considerable quantity of blood may be detracted; but if, on the contrary, the pulse sinks, and the blood comes away only grattatim, the vein should be closed. The object of venesection is not now to be obtained. The blood no longer flows from the congested vessels to supply that taken from the vein in the arm—we do not relieve congestion or divert the fluxion from the digestive passage; the small quantity of blood we obtain is taken from that still circulating in the system, and however deteriorated in quality, its

quantity cannot be lessened with safety until the circulation is re-established.

When it would not be prudent to take blood from the arm, in consequence of the feebleness of the pulse, and the exhaustion of the patient, topical depletion by leeches or cups to the abdomen, may often be resorted to, with the effect of relieving the abdominal congestion and facilitating re-action; but when the collapse is complete, it is most frequently as difficult to detract blood from the surface as from a vein.

The patients even in this stage, when cold and pulseless, generally have the utmost repugnance for hot and stimulating drinks; they, on the contrary, incessantly demand cold drinks, and their desires should be gratified. Small pieces of ice, cold lemonade or gum water, or pure water, should be given them. Mucilaginous enemata should likewise be administered. Some of the English practitioners employed copious enemata of warm water, and they say with advantage. They may act beneficially as fomentations to the irritated intestines, and they also supply fluid for absorption, and when comfortable to the patient may be used. When there is, however, a sensation of intense heat in the abdomen, we think that *cold* mucilaginous enemata would be preferable, and should a favourable case present, we would not hesitate to resort to them—applying at the same time warm fomentations externally.

Bottles of warm water should be applied to the soles of the feet, and fomentations rendered somewhat stimulating to the extremities and abdomen.

Such are the principal measures to be employed for the primary lesions; but in this stage secondary disorders occur, which entail fatal results, and require the attention of the practitioner. The most important of these is the condition of the blood, which, deprived of a great proportion of its serum, saline matters and fibrine, no longer circulates, and hence coldness of the body, difficulty of respiration, &c. To supply to the blood some of its lost elements, salt and water have been injected into the veins, and with the effect most generally of reviving the circulation, relieving the breathing, and restoring animal temperature. In many cases, however, this amendment has been but temporary, and the patients have again sunk and died; and hence the remedy seems to have got out of repute. It appears to us, however, to have been too speedily abandoned. Too much was expected from it. All that it can accomplish is to remedy to a certain extent the condition of the blood, upon which the cessation of the circulation depends, thus restore this function, and relieve the phenomena

immediately resulting from its cessation. But the primary disorder continuing, the blood is soon reduced to its former condition, (probably rendered worse, since no fibrine having been supplied, its proportion is smaller,) and the secondary phenomena reappear. Whilst then the circulation is restored, the gastro-intestinal irritation must be allayed, the afflux to these organs arrested, and the secretions stopped; and as prolonging life, so as to enable us to employ remedies for this purpose, venous injection, it appears to us, may be resorted to.

It must be confessed however, that when this stage has gone to that period—when the white evacuations are replaced by red and bloody ones—when the pulse has ceased in the radial arteries—the skin icy cold, of a deep blue colour—much is not to be expected from any remedies. It is in vain now, that we resort to depletion. If we open a vein, it furnishes scarcely a few drops of black, viscid blood; and the leeches will not attach themselves, or if they do, they fall off before half filled, and their punctures do not bleed. It is impossible in this condition to induce revulsion; the connexion between the organs is broken up; remedies produce no effect beyond the part to which they are immediately applied, as has been truly observed by M. Bouillaud, “the physician has no longer to contend against disease, but against the grasp of death; and the gift of miracles is unhappily not among the number of our therapeutic means.”

Even in this condition, however, venous injection has been tried, and with the effect of reviving the circulation, relieving the disorder caused by its cessation, and apparently prolonging life.

But when nothing remains to be done for the cure of the patient, we should at least endeavour to solace him, and especially avoid distressing him.

“Now,” remarks M. Gendrin, “we would injure him, by increasing the oppression and anxiety which overwhelm him, if we heat him and give him hot drinks; we would even rapidly accelerate his death by this treatment, which his universal coldness suggests. His last moments would even be prolonged by introducing fresh air into the chamber, by giving him cold water by spoonfuls, and by allowing him to uncover his chest: these are the only means I have recommended in such cases. In hospitals it would suffice to do nothing but give water to the patients. In this stage they uncover themselves; and appear to breathe easier in a current of air, and in wards not heated; freed from coverings which would impede the painful motions of their chest.” p. 192.

M. Bouillaud describes two forms in which reüction may present itself, one a simple excitement of the sanguineous system, followed by more or less abundant perspiration, terminating the disease; in the second, irritation of the brain comes on whilst the gastro-intestinal irritation persists, and the assemblage of typhoid symptoms appear.

The treatment of the first is simple; cooling and demulcent drinks are all that is required from the physician, nature accomplishes the rest. When the reaction is too great, it must be moderated either by general bleeding, or leeches to the abdomen or anus.

The treatment of the typhoid reaction is much more difficult. The best authorities here, concur as to the propriety of antiphlogistics; for even those practitioners who deny the existence of any irritation of the gastric passages during the collapsed stage, confess its existence during the period of reaction. It may be readily conceived, however, remarks M. Bouillaud, that in persons exhausted by profuse evacuations, we cannot bleed as copiously as in those who have suffered from ordinary gastro-intestinal irritation, upon which is engrafted a more or less severe irritation of the brain. In every inflammation it is, moreover, a generally recognised principle, that the treatment ought to be modified according to the general state of the individual.

"It is not uncommon in the typhoid stage," he adds, "for bilious vomitings to replace the discharge of the choleric fluid; and still more frequently for a fatiguing and obstinate hiccough, with frequent eructations, to succeed to the vomiting; in both cases we may be assured that the stomach continues to be the seat of an active and violent irritation. We can hope to conquer this irritation only by the repeated application of leeches to the epigastric region. I have cured by this measure, very recently ton, hiccough that had resisted every other mode of treatment. Opiates are here useless; antispasmodics and magnesia equally fail: if they relieve the hiccough for a short time, it does not fail to reappear, and all we often gain by their use is an increase of the gastric irritation, of which the hiccough is the effect. Ice internally and over the epigastric region has been sometimes employed with success.

"But it is not sufficient to combat the affection of the digestive passages; the cerebral affection, the source of the phenomena termed typhoid, imperiously demand an appropriate treatment. If the patient is strong and vigorous, and the pulse still retains some volume, recourse may be had to general bleeding; but if the contrary be the case, we must abstain from this measure. In every condition, leeches applied to the temples, or behind the ears, and ice to the head, should be resorted to immediately on the development of the first symptoms of cerebral congestion. The extent to which local bleeding is to be carried, and the frequency of its repetition must be determined by the violence of the congestion, and the strength, age, sex, and constitution of the patient.

"As to ice, if we wish to obtain good effects from it, its application must be continued for several hours; and it is often necessary to apply several bladders with ice, successively to the head.

"Revulsives to the lower extremities, (sinapisms and blisters,) are the best auxiliaries to these measures." p. 314, 315.

We may now notice another condition of reaction described by M. Gendrin, as of frequent occurrence. The reaction is here re-established with but little fever; yet there is a marked dryness of the

skin, agitation, insomnia, and deficiency of urine—in such cases M. G. says, that a tepid bath is often the best measure for altering this condition, for the relief of which, benefit is almost always derived also from prudent local depletion.

The management of convalescence is not the least difficult part of the treatment of cholera. Relapses cannot be too carefully guarded against, since they are usually fatal. Convalescence is so troublesome, observes M. Gendrin, and the disorders which attend it, though transient, and apparently not severe, are so obstinate, that the physician is obliged to modify, in many ways, the employment of therapeutic means. M. G. continues in general during convalescence the use of Seltzer water, often mixed with milk—he next allows weak broths, at first pure, afterwards with a little rice; then roasted poultry taken in small quantity, and he gradually augments the quantity of food, "as in convalescence from violent gastro-enteritis." When there remains some tension, with heat of the abdomen, dry tongue, anorexia, irregular returns of diarrhoea or nausea, he insists further upon the antiphlogistic treatment; and frequently orders the warm bath. When the patient is troubled with anorexia, borborygmi, and frequent flatulencies, and the tongue is pale, large, and pasty, M. G. says that he has had recourse, with advantage, to small doses of the bitter tonics, as the bark, &c.

We have thus cursorily sketched the outlines of what appears to us to be the rational treatment of cholera, and if the views we have sustained of the pathology of this disease be correct, it is that which, with some modifications, no doubt, must be ultimately adopted.

A very useful task remains still to be accomplished, viz. the particular investigation into the value of the various remedies that have been employed in the treatment of the disease under notice. Some of them not yet alluded to, might no doubt be advantageously employed, and it is not less important to possess accurate knowledge of the effects of those remedies which are injurious, for in a science like that of medicine, where we are often driven from our direct course by idiosyncrasies and the peculiarities of constitution of the sick, and where we are as often tempted to depart from it by treacherous symptoms, it is not less necessary to know what is injurious than what is useful. The buoy is as valuable as the guide post. Hereafter, we may undertake this task, but the length to which this article has already extended admonishes us that it is time to conclude. We must not close, however, without offering a few remarks on one or two of the most extensively used and most lauded remedies.

The first of these which we shall notice are *emetics*, whose well-

known effects in determining to the surface, led to their employment in cholera for the purpose of relieving internal congestion, and promoting reäction. That this effect sometimes follows their operation, and that even they aid in its production, testimony of too strong a character might be adduced to admit of doubt. But it appears from equally authoritative evidence that in a large number of cases they fail to excite reäction, and even in those in which it succeeds; in some the reäction is but momentary, and in others it develops accidents scarcely less fatal than those which it was employed to relieve. Thus the sulphate and hydrchlorate of soda, besides their emetic property, possess that of rapidly suppressing the choleric secretion. Now if the suppression of the evacuations were of very great importance and constituted the most direct means of determining reäction, the administration of these salts would be very often succeeded by beneficial results, for they have very frequently the direct effect of promptly suppressing the phlegmorrhagic evacuations. But this suppression "is always accompanied by an active inflammation of the gastro-intestinal villous membrane,"* and we thus have an acute gastro-enteritis substituted for the secretory irritation of cholera. Now the question to be solved is, whether the patient is a gainer by this change in his disease or not. Acute gastro-enteritis is unquestionably a most fatal disease, and no practitioner would think of wantonly entailing it upon his patient. But where the choleric evacuations are excessive, the patient rapidly sinking under the discharge—bleeding, as it were, to death—and where the direct measures for the cure of the disease have failed, it may be expedient to arrest the discharge by the salt emetic, even though at the cost of an acute gastro-enteritis.

The utility of this remedy is sustained by the high authority of our esteemed collaborator and friend, the distinguished Professor of the Institutes and Practice of Medicine in the University of Pennsylvania, who gave it a pretty extensive trial in his hospital, during the prevalence of the cholera in Philadelphia. Professor Chapman's experience, it is just to add, has led him to entertain a higher estimate of its efficacy than we have expressed; but this skilful and judicious practitioner, immediately followed up the use of the emetic, by bleeding, cups to the abdomen, and blisters to the same part, with revulsives to other portions of the body, by which the ill effects of the emetic must have been to a greater or less extent controlled.

Panic-struck at the extreme prostration attendant upon this disease, many practitioners rushed immediately to the use of the most

* Gendrin, p. 240.

powerful stimulants, administered in the largest doses, for the relief of this symptom.

"For every observer," remarks M. Bouillaud, "who like the vulgar, does not look beyond the symptoms of diseases, and who takes, as it were, the shadow for the substance, the sole indication which presents itself to his mind, in the algid or collapsed stage of cholera, is to excite, reanimate, stimulate, strengthen. Absorbed entirely by the exterior phenomena, such a superficial observer cannot conceive, at first, the idea of any other indication, and he especially revolts against the antiphlogistic plan. However, if less exclusively preoccupied with exterior symptoms, he will reflect an instant and investigate the disease more deeply, he will soon perceive that these external symptoms, the vivid picture of debility, coincide with the phenomena of a vast secretory irritation or phlegmorrhagia of the digestive organs, and that these latter phenomena even preceded the others. This gleam of light will not be lost in the treatment. The indication to restore the great and vital functions of circulation, of respiration and of calorification, doubtless will not appear to him less urgent; but he will demand whether the best means of fulfilling this indication, really consists in the application of excitants, tonics, and stimulants to a surface already too much excited, too much irritated, or whether it would not be better to soothe the irritated membrane, to cool its inflamed surface by the means we have advised, at the same time that we endeavour to revive the exhausted functions, by applying to other parts the stimulants, the positive indication for which has been discovered. Great prostration also exists in that form of gastro-enteritis which has been designated by some by the name of typhoid fever. Is it believed that it would be in accordance with a rational and sound therapeutics to combat this prostration by administering internally, as was too long done, the most powerful tonics and the most heroic stimulants? This man who has scarcely any pulse, whose extremities are already cold, has fallen into this state entirely in consequence of an acute or of a sub-acute inflammation of the peritoneum; would you revive him, warm him, by injecting stimulants and tonics into his peritoneal cavity?"

"It is not sufficient then to ascertain the existence of phenomena which indicate excessive prostration; it is necessary to seek the source of this prostration, without which we run the terrible risk of aggravating the evil in endeavouring to relieve it. I declare, with the most perfect conviction, and with that good faith without which no one is ever worthy the name of physician, that whoever in the present state of our knowledge respecting the nature of cholera morbus, would propose as the principal basis of the treatment of this formidable disease, internal stimulants and tonics, would commit, to use an expression of Bichat's, the most fatal therapeutic absurdity. That this method was employed in the commencement of the epidemic, that is at a period when we were for the most part, I am bold enough to say it, in the grossest ignorance of the true nature of cholera morbus, may be conceived, excused, even approved to a certain point. That this method may have been so lauded as to have been tried by physicians who now yield to it but very moderate confidence, does not astonish me, for I myself once employed it. But its use should be forever abandoned. Experience and reason, in accordance herewith the instinct of patients, equally

prove this. If it is not immediately followed by very serious accidents it incontestably disposes to typhoid phenomena, which so rarely spare those who have escaped the collapsed stage." pp. 298-300.

The extreme coldness of the body in the algid stage of cholera, seems to have led some physicians to think that the most important indication in the treatment was to warm the patient, and the mere enumeration of the various methods devised for this purpose, would occupy several pages. At present it is known that the application of external warmth effects little towards the cure. To heat a cadaverised choleric patient, is not to revive him, as is just remarked by M. Bouillaud. We revive him only in proportion as we place him in a condition to warm himself, that is, by reviving the circulation and relieving the fundamental lesion upon which the algid condition depends. The patient is not in a dangerous state, threatening immediate death, because he is cold—on the contrary, his coldness results from this dangerous state. Nearly all the recent writers appear to accord, indeed, as to the inutility and even injurious effects of resorting to measures for heating the body. "Heat and dry vapour," says M. Gendrin, "are of all the measures employed against cholera, the most dangerous, and those which have done most harm." The testimony of Professor Chapman is to the same purpose. The suffering induced by them is equal, he says, to that he has ever witnessed from the application of any remedial process.

It appears to us, that they can be only useful as revulsives, and that they cannot act as such, except in the early stages, or in the mild cases of the disease. Cold water douches and frictions with ice, appear to have been productive of more benefit than warm applications.

The saline treatment, as recommended by Dr. Stevens, has attracted no little notice, but the statements of its effects are so utterly contradictory, involving even the veracity of the relators, that it is impossible to judge what value experience will ultimately affix to it. This treatment is, however, based upon false principles, viz. that the essence of the disease consists in the deficiency of saline matters in the blood—a condition which is but a secondary effect, and one of minor importance. In the premonitory stage, this deficiency, as is shown by the analysis of Dr. O'Shaugnessy, does not exist; the employment of the remedy then, for the fulfilment of that supposed indication is useless. Whether it possesses any prophylactic-power; how far it is useful in the later stages by supplying proper materials for absorption, and to what extent its utility in this respect is counteracted by its tendency to occasion ordinary gastro-enteritis, are points we are not at present prepared to discuss.